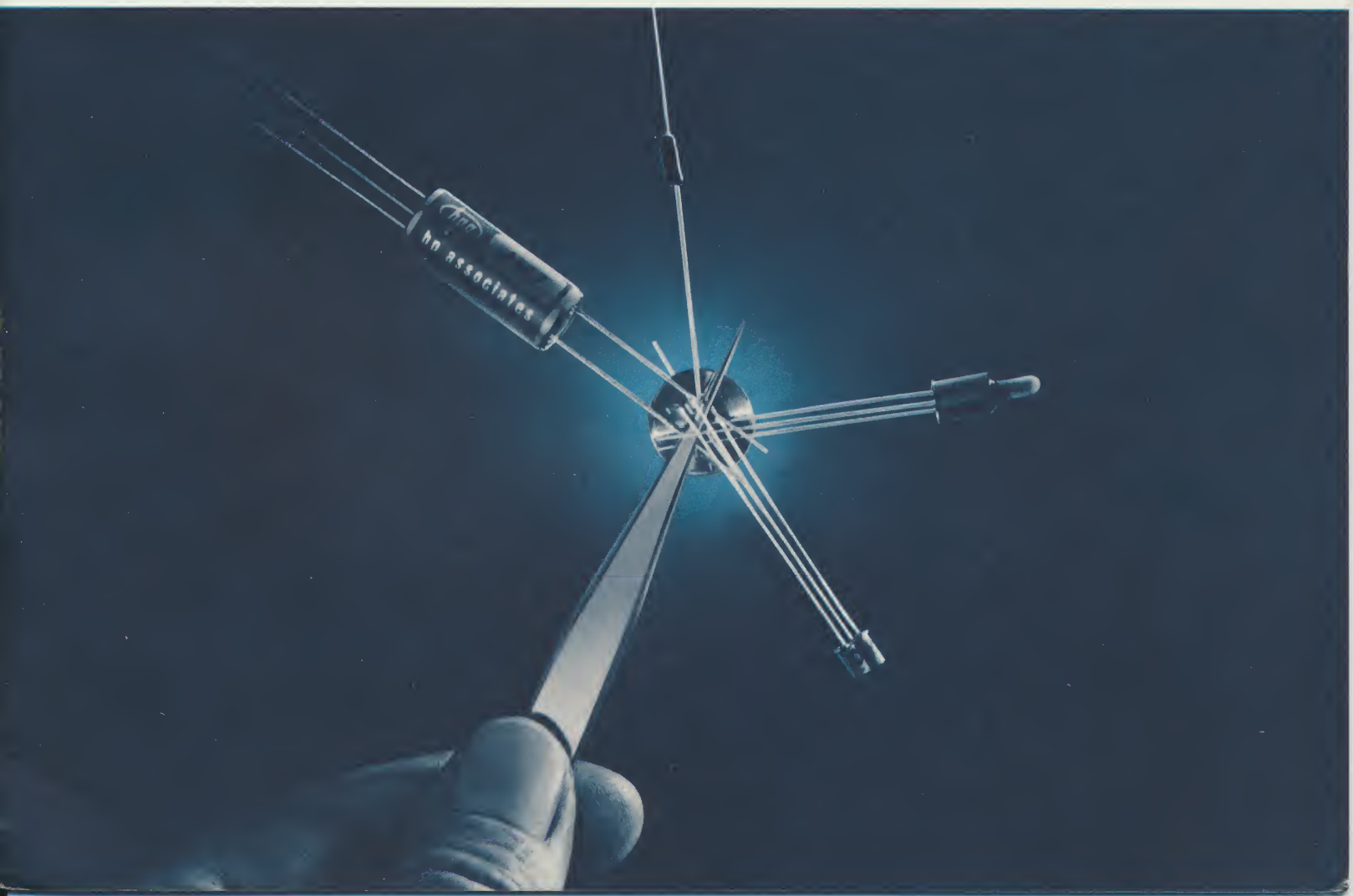
condensed catalog No. 11

HEWLETT PACKARD hp HP ASSOCIATES

solid state devices



HPA... an acknowledged leader in solid-state technology

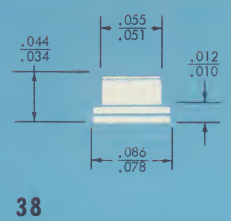
At Hewlett-Packard/HP Associates, many new technologies have been mastered . . . and new products introduced in past years. Rapid acceptance of these advances by engineers, scientists and purchasing people throughout our industry has become a source of pride for us . . . and a continual acknowledgment of HPA's state-of-the-art.

In this catalog, *more* new products from HPA are introduced . . . reflecting HPA's position of leadership. These new products are called out for you; look for them as you review each section. The number of new devices will confirm HPA's continuing progress that makes your design job easier.

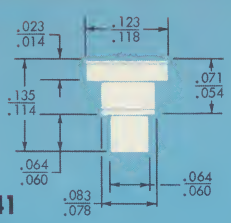
NEW DEVICE

look for this sign . . .

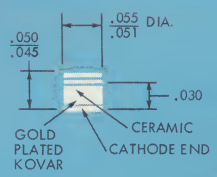
standard HPA package outlines



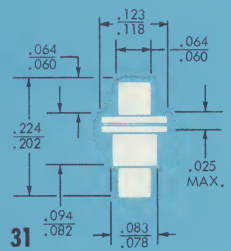
38



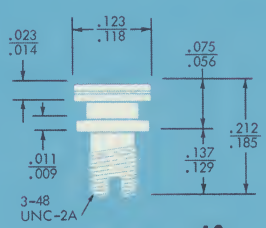
41



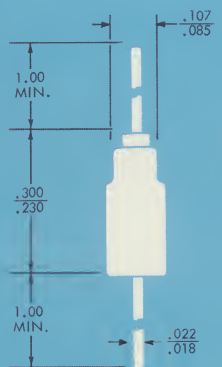
44



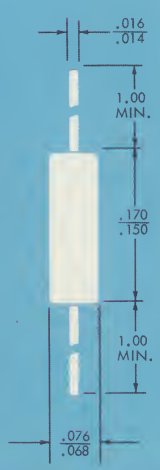
31



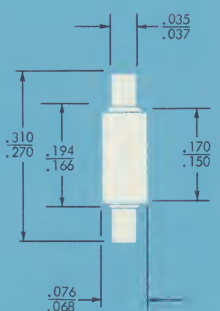
40



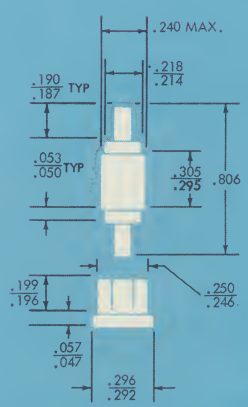
11



15



19



20

The standard HPA devices described in this brochure are available in the following package outlines. Other package configurations are available on request.

step recovery diodes

Pulse generation, shaping and pulse delay

High-order, efficient, single-stage frequency multiplication

The HPA Step Recovery Diodes are epitaxial, surface-passivated silicon devices with abrupt junctions. Process control of the very abrupt junction gradient permits controlled charge storage. Environmental tests are performed to insure that they will meet the latest revisions of MIL-STD-750, MIL-STD-202 and MIL-S-19500.

These Step Recovery Diodes, while conducting in the forward direction, store charge. When the reverse drive voltage depletes the stored charge (see Figure 1), the diode appears as a high impedance. During this high impedance condition, a voltage impulse is generated (Figure 2). These pulses occur at a rate equal to the drive frequency. When this series of pulses is terminated in a resistive load, a comb spectrum is generated (Figure 3). By terminating the pulses in a resonant load, the spectrum is optimized at the desired output frequency for harmonic generation (Figure 4).

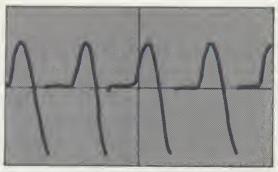


Figure 1. Step recovery diode current

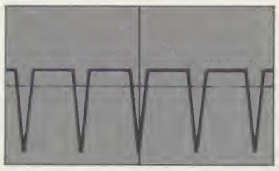


Figure 2. Step recovery diode voltage

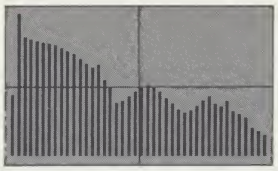


Figure 3. Comb generation

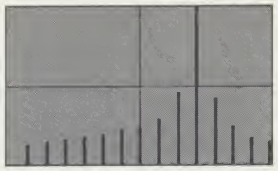


Figure 4. Harmonic generation

device specifications

HPA Device	Package Outline	V_F MAX. @ V	I_F mA	C_O MAX. pF	V_{BR} MIN. V	I_R MAX. @ nA	V_R V	τ MIN. ns	t_r MAX. @ ps	I_F mA	θ_{JC} MAX. °C/W
0112	11	1.0	150	3.0	35	50	−30	50	300	15	300
0132	31	1.0	150	3.0	35	50	−30	50	300	15	100
0113	11	1.0	200	10.0	35	50	−30	90	500	10	300
0133	31	1.0	200	10.0	35	50	−30	90	500	10	75
0114	11	1.0	300	10.0	35	50	−30	125	400	10	300
0134	31	1.0	300	10.0	35	50	−30	125	400	10	75
0151	15	1.0	40	1.6	15	10	−10	20	150	15	600
0251	31	1.0	40	1.6	15	10	−10	20	150	15	250
0152	15	1.0	40	2.1	15	10	−10	20	150	15	600
0252	31	1.0	40	2.1	15	10	−10	20	150	15	250
0153	15	1.0	40	1.1	25	10	−10	20	150	15	600
0253	31	1.0	40	1.1	25	10	−10	20	150	15	250
0154	15	1.0	40	1.1	25	10	−10	20	200	15	600
0254	31	1.0	40	1.1	25	10	−10	20	200	15	250
0180	11	1.0	250	8.0	65	10	−30	100	500	10	300
0240	31	1.0	450	8.0	65	10	−30	100	500	10	60
0181	11	1.0	350	8.0	65	10	−30	100	500	10	300
0241	31	1.0	600	8.0	65	10	−30	100	500	10	60
0182	15	1.0	75	2.0	35	10	−10	30	200	15	600
0242	31	1.0	100	2.0	35	10	−10	30	200	15	100
0183	15	1.0	125	2.0	35	10	−10	30	150	15	600
0243	31	1.0	150	2.0	35	10	−10	30	150	15	100
TEST CONDITIONS				$V_R = 0$ V, $f = 1.0$ MHz	$I_R = 10\ \mu$A			$I_F = 1.7\ I_R$			Note 1

HPA Device	Package Outline	P_{OUT} @ 2 GHz W	V_F @ I_F MAX. V	mA	C_O pF Min.	pF Max.	C_{VR} pF Min.	pF Max.	V_{BR} MIN. V	τ MIN. ns
0300	40	2.0	1.1	1000	4.0	10.0	2.5	6.5	65	100
TEST CONDITIONS		$P_{IN} = 15$ W @ 200 MHz			$f = 1.0$ MHz, $V_R = 0$ V		$f = 1.0$ MHz, $V_R = 10$ V		$I_R = 10\ \mu$A	$I_F = 1.7\ I_R$

HPA Device	Package Outline	P_{OUT} @ 10 GHz mW	C_{VR} pF Min.	pF Max.	V_{BR} MIN. V	τ MIN. ns	θ_{JC} MAX. °C/W
0320	41	150	0.7	1.3	20	10	50
TEST CONDITIONS		$P_{IN} = 2$ W @ 2 GHz	$f = 1.0$ MHz, $V_R = 10$ V		$I_R = 10\ \mu$A	$I_F = 1.7\ I_R$	Note 2

Note 1: $P_{DISS} = \frac{175°C - T_A}{\theta}$

HPA outline 11 and 15 packages are mounted on a printed circuit board in still air; HPA outline 31 package is mounted on an infinite heat sink.

Note 2: $P_{DISS} = \frac{200°C - T_A}{\theta_{JC}}$

HPA outline 41 package is mounted on an infinite heat sink.

hot carrier diodes

Majority carrier conduction

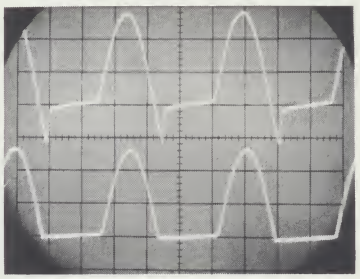
Low leakage and high conductance

Low forward threshold voltage

High pulse power capability

These diodes utilize a closely controlled metal semiconductor junction which provides virtual elimination of charge storage. The result is extremely fast turn-on and turn-off times with excellent diode forward and reverse characteristics. This process results in lower noise characteristics and wider dynamic range (conversion loss and noise figure are relatively insensitive to local oscillator power variations over the range of 0.5 mW to 20 mW). They are especially useful for mixer and detector applications to improve receiver sensitivity. Improved resolution in ultra-high speed sampling and switching networks is possible by combining the picosecond lifetimes, low capacitance and excellent forward to reverse characteristics of the device.

Comparison of recovery time of the Hot Carrier Diode (lower trace) with a conventional high speed 1 nsec switching diode (upper trace). Sweep speed, 10 nsec/cm; vertical sensitivity, 20 mA/cm; applied signal, 30 MHz sine wave.



device specifications

HPA Device	Package Outline	Forward Voltage @ Forward Current		Forward Voltage @ Forward Current		Breakdown Voltage	Leakage Current	Capacitance	Effective Minority Carrier Lifetime*
		V_{F_1}	I_{F_1}	V_{F_2}	I_{F_2}	V_{BR}	I_R	C_O	τ
2301 Min. Max.	15	1.0 V	50 mA	0.4 V	1.0 mA	30 V	300 nA	1.0 pF	100 ps
2302 Min. Max.	15	1.0 V	35 mA	0.4 V	1.0 mA	30 V	300 nA	1.0 pF	100 ps
2303 Min. Max.	15	1.0 V	35 mA	0.4 V	1.0 mA	20 V	500 nA	1.2 pF	100 ps
TEST CONDITIONS						$I_R = 10\ \mu A$	$V_R = 15$ V	$V_R = 0$ V f = 1.0 MHz	
2900 Min. Max.	15	1.0 V	20 mA	0.4 V	1.0 mA	10 V	100 nA	1.5 pF	120 ps
TEST CONDITIONS						$I_R = 10\ \mu A$	$V_R = 5.0$ V	$V_R = 0$ V f = 1.0 MHz	

* These diodes are too fast to measure in conventional circuits utilizing standard reverse recovery time measurements. Therefore, the effective minority carrier lifetime is specified as τ instead of T_{rr}. Devices are hermetically sealed in a miniature glass package, 0.160" long, 0.070" in diameter, digitally coded.

microwave mixer diodes

Low and stable noise figure

High tangential sensitivity

Uniform and repeatable RF characteristics

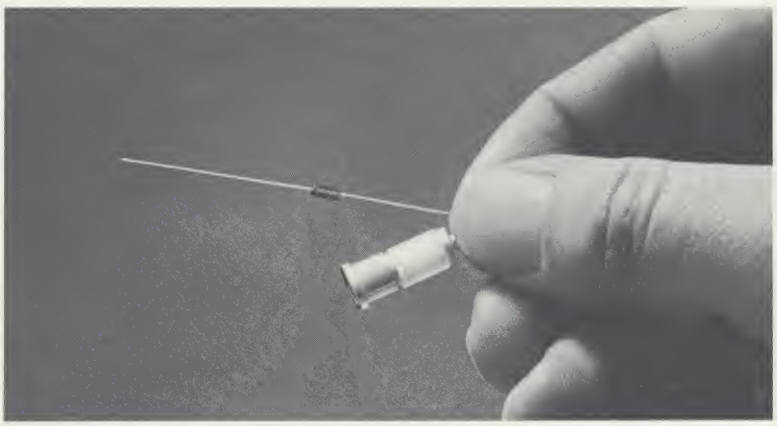
Microminiature size

High pulse burnout resistance

Large dynamic range at high LO powers

Low IF and video impedance

Microwave mixer diodes employing metal semiconductor (Schottky) barriers offer improvements in noise figure, reliability, and dynamic range when compared to conventional point contact diodes. Conversion loss and noise figure are 1 to 2 dB lower than corresponding parameters of the best available point contact microwave devices and I/f noise is better than 25 dB lower. Ruggedness, both physical and electrical, is superior, as is the basic device reliability. Consistent mixer performance can be readily attained with HPA Microwave Mixer Diodes because of (1) the relative ease with which they can be matched to 50 ohms and (2) the uniformity of the product resulting from advanced production techniques.



device specifications

TEST FREQUENCY		2.0 GHz			3.0 GHz				8.0 GHz			9.375 GHz
PACKAGE OUTLINE		15	19	20	15	19	20	38	15	19	20	44
NF_o† = 6.0 dB	Single	2400	2406	2403	2565	2561	2563	2511	—	—	—	—
	Pair*	2401	2407	2404	2566	2562	2564	2516	—	—	—	—
	Quad*	—	—	—	—	—	—	—	—	—	—	—
NF_o = 6.5 dB	Single	2365	2415	2366	2550	2556	2553	—	—	—	—	2702
	Pair*	2418	2416	2417	2551	2557	2554	—	—	—	—	2707
	Quad*	—	—	—	2552	2558	2555	—	—	—	—	—
NF_o = 7.0 dB	Single	2350	2413	2353	2520	2526	2523	—	2602	2612	2622	—
	Pair*	2351	2414	2354	2521	2527	2524	—	2607	2617	2627	—
	Quad	2374	—	—	2522	—	—	—	—	—	—	—
NF_o = 7.5 dB	Single	—	—	—	—	—	—	—	2603	2613	2623	—
	Pair*	—	—	—	—	—	—	—	2608	2618	2628	—
	Quad*	—	—	—	—	—	—	—	—	—	—	—
VSWR (TYPICAL)		1.3			1.5				1.5			1.5
Z_{IF} (OHMS) TYPICAL		200			200				200			300

† The Noise Figure stated is a single sideband receiver Noise Figure using a 30 MHz 1.5 dB IF amplifier. Local oscillator power is 1 mW.

* Noise Figure Match
ΔNF_o 0.3 dB max.
IF Impedance Match
ΔZIF 25 ohms max.

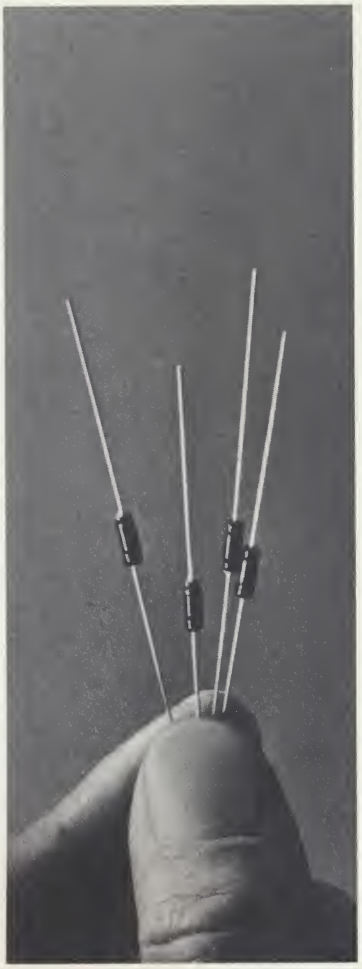
high conductance diodes

High conductance

Low capacitance

Nanosecond turn-on and turn-off

The HPA 1000 series of High Conductance Diodes feature planar silicon epitaxial construction to provide high conductance, low capacitance, and nanosecond turn-on and turn-off. Process control of the diode manufacture enables specification of effective minority carrier lifetime. Turn-on time and voltage overshoot are minimized in these diodes of low conductivity modulation. These diodes are ideally suited for applications such as thin film memory drives, pulse generation, input gates, or wherever high conductance is required without loss of speed.



device specifications at 25°C

HPA Device	Package Outline	Forward Current I_{F_1} Min.	Forward Current I_{F_2} Min.	Breakdown Voltage V_{BR} Min.	Reverse Current I_{R_1} Max.	Reverse Current I_{R_2} (150°C) Max.	Capacitance C_O Max.	Reverse Recovery Time t_{rr} Max.	Turn-on Time t_{on} Max.	Lifetime τ Max.	Lifetime τ Typ.	Rectification Efficiency R.E. Typ.	Price 1 - 99 100 - 999
1001	11	150 mA	500 mA	35 V	200 nA	200 μA	1.5 pF	1.5 ns	2.5 ns	600 ps	350 ps	65%	$4.25 3.20
1002	11	300 mA	800 mA	35 V	200 nA	200 μA	3.0 pF	2.0 ns	2.5 ns	600 ps	350 ps	65%	4.40 3.30
1003	11	100 mA	300 mA	25 V	200 nA	200 μA	2.0 pF	1.5 ns	2.0 ns	600 ps	350 ps	65%	3.10 2.35
1004	11	200 mA	600 mA	25 V	200 nA	200 μA	4.0 pF	2.0 ns	2.0 ns	600 ps	350 ps	65%	3.35 2.50
1006	11	150 mA	500 mA	50 V	200 nA	200 μA	1.1 pF	1.5 ns			350 ps	65%	5.15 3.85
TEST CONDITIONS		V_F = 1.0 V (Note 1)	V_F = 1.4 V (Note 1)	I_R = 10 μA	(Note 2)	(Note 2)	V_R = 0 V f = 1.0 MHz						

Note 1: Measured at a repetition rate not to exceed the power dissipation.

Note 2: V_R = 35 V for 1006; V_R = 30 V for 1001, 1002; V_R = 20 V for 1003, 1004.

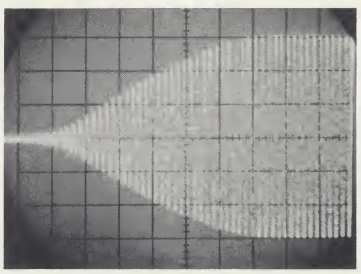
PIN diodes

New method of modulating/switching microwave signals

Improved stability and reliability through surface passivation

These devices make possible a new method of modulating microwave signals. When placed across a transmission line, the device acts as an absorption-type attenuator and allows sine-wave, square-wave and pulse modulation with no frequency pulling of the signal source. Turn-on times of less than 20 nsec for an on-off ratio of greater than 30 dB are possible. Planar passivation insures long-term stability and reliability. The HPA PIN diodes are especially useful where the lowest possible residual series resistance and junction capacitances are required for high on-to-off switching ratios.

This oscillograph shows a 100 mV RF carrier modulated by PIN diodes. It is shown turning on in less than 20 nsec. Sweep speed is 5 nsec/cm.



device specifications at 25°C

HPA Device	Package Outline	Breakdown Voltage V_{BR} @ 10 μA	Forward Voltage V_F @ I_F = 150 mA	Forward Voltage V_F @ I_F = 100 mA	Total Capacitance C_{VR} @ −50 V (Note 1)	Residual Resistance R_R I_F = 50 mA	Lifetime τ I_F = 50 mA	Price 1 - 9 10 - 99
3001	15	150	—	1.0	.30	2.5	100	$13.35 11.35
3002	15	200	1.0	—	.30	2.5	100	15.65 13.30
3101	38	150	—	1.0	.32	2.5	100	27.00 23.00
3102	38	200	1.0	—	.30	2.5	100	30.00 25.50
3201	31	150	—	1.0	.35	2.5	100	22.00 18.75
3202	31	200	1.0	—	.32	2.5	100	25.00 21.25
UNITS		V min.	V max.		pF max.	Ω max.	nsec min.	

Note 1: Diode junction capacitance is typically .075 to .100 pF.

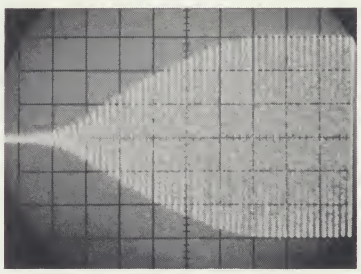
PIN diodes

New method of modulating/switching microwave signals

Improved stability and reliability through surface passivation

These devices make possible a new method of modulating microwave signals. When placed across a transmission line, the device acts as an absorption-type attenuator and allows sine-wave, square-wave and pulse modulation with no frequency pulling of the signal source. Turn-on times of less than 20 nsec for an on-off ratio of greater than 30 dB are possible. Planar passivation insures long-term stability and reliability. The HPA PIN diodes are especially useful where the lowest possible residual series resistance and junction capacitances are required for high on-to-off switching ratios.

This oscillograph shows a 100 mV RF carrier modulated by PIN diodes. It is shown turning on in less than 20 nsec. Sweep speed is 5 nsec/cm.



device specifications at 25°C

HPA Device	Package Outline	Breakdown Voltage V_{BR} @ 10 μA	Forward Voltage V_F @ I_F = 150 mA	Forward Voltage V_F @ I_F = 100 mA	Total Capacitance C_{VR} @ −50 V (Note 1)	Residual Resistance R_R I_F = 50 mA	Lifetime τ I_F = 50 mA	Price 1 - 9 10 - 99
3001	15	150	—	1.0	.30	2.5	100	$13.35 11.35
3002	15	200	1.0	—	.30	2.5	100	15.65 13.30
3101	38	150	—	1.0	.32	2.5	100	27.00 23.00
3102	38	200	1.0	—	.30	2.5	100	30.00 25.50
3201	31	150	—	1.0	.35	2.5	100	22.00 18.75
3202	31	200	1.0	—	.32	2.5	100	25.00 21.25
UNITS		V min.	V max.		pF max.	Ω max.	nsec min.	

Note 1: Diode junction capacitance is typically .075 to .100 pF.

microwave switches/ variable attenuators

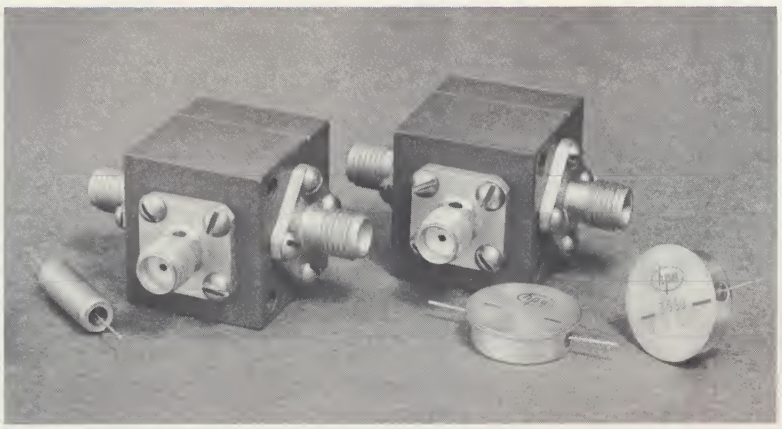
DC to 18 GHz bandwidth

High isolation, extremely low insertion loss

Connector styles — N, TNC, OSM, Stripline, and Coax

SPST and SPDT configurations

HPA Microwave Switches are versatile, electrically actuated control elements that are ideally suited for a large variety of high frequency and microwave circuits including: Pulse Modulators, Amplitude Modulators, Phase Shifters, Multiple Throw Switches, Phased Array Antennas, T-R Switches, Limiters, Attenuators, Automatic Gain Control Circuits, Power Leveling Circuits, Redundant Microwave Systems, Signal Synthesizers, Frequency Synthesizers, Suppressed Carrier Modulators, Pulse Shapers, Antenna Lobing Circuits.



device specifications

HPA Device	Bias Terminal	RF Terminal	Bias Polarity For Switch OFF	Frequency Range	Switching Time	Insertion Loss	Isolation	Price 1 - 9
3501 series	BNC	Optional TNC or N	Optional Pos. or Neg.	200 MHz to 12.4 GHz	100 - 300 ns	.5 to 1.5 dB	25 to 45 dB	$275
3530	Stripline integrated unit, wire leads for RF terminals.		Neg.	DC to 12.4 GHz	50 ns	.5 to 1.5 dB	24 to 45 dB	$125
3531			Neg.	12 to 18 GHz	50 ns	1.5 dB	45 dB	$125
3540			Pos.	DC to 12.4 GHz	10 ns	.5 to 2.0 dB	20 to 45 dB	$125
3550 series	OSM	OSM	Optional Pos. or Neg.	200 MHz to 12.4 GHz	100 - 300 ns	.5 to 1.5 dB	25 to 45 dB	$325
3560 series	OSM	OSM	Optional Pos. or Neg.	12.4 GHz to 18 GHz	100 - 300 ns	2.0 dB	45 dB	$325
3570 series	BNC	Optional TNC or N	Pos.	1 GHz to 12.4 GHz	10 ns	1.5 to 2.0 dB	30 to 35 dB	$275
3580	BNC	N	Neg.	4 GHz to 8 GHz (SPDT)	15 ns	1.6 to 2.5 dB	70 to 90 dB	$495
3602	Coaxial Integrated Unit, wire leads		Neg.	DC to 18 GHz	50 ns	0.7 dB	40 dB	$100
3603			Neg.	DC to 18 GHz	50 ns	0.8 dB	60 dB	$150
3604			Neg.	DC to 12.4 GHz	50 ns	1.0 dB	80 dB	$175
3622			Pos.	DC to 18 GHz	10 ns	0.7 dB	33 dB	$100
3623			Pos.	DC to 12.4 GHz	10 ns	0.7 dB	45 dB	$150
3624			Pos.	DC to 12.4 GHz	10 ns	0.6 dB	60 dB	$175

photoconductor devices

Low noise and offset

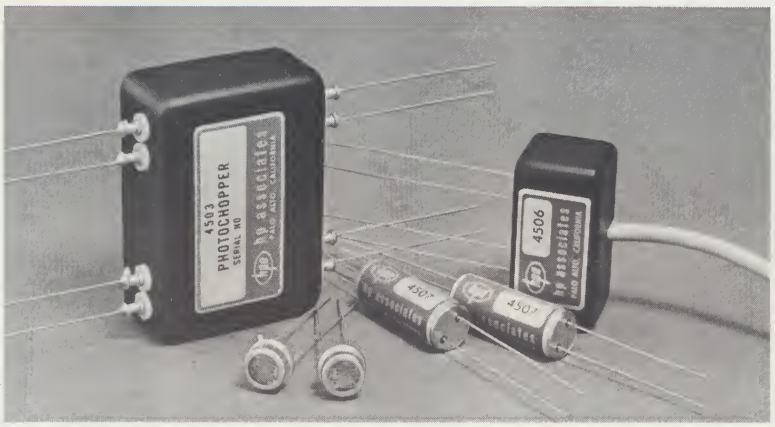
High efficiency

Low driving power consumption

High stability

Large dynamic range

HP Associates' photoconductor devices utilize specially designed, hermetically sealed photocells manufactured by HPA. The photocells are illuminated with self-contained neon glow lamps (incandescent bulbs in the HPA 4510), stabilized and selected to provide long life and reliable operation. The photochoppers contain two synchronous SPDT switches for applications requiring series-shunt modulation and demodulation, while the photomodulators contain one SPDT switch for applications requiring modulation only. The HPA 4507 and 4508 PCR's are ideally suited for applications where SPST switching is required, while the 4510 is suited for applications requiring electrically controlled resistances.



device specifications, modulators, and PCR's

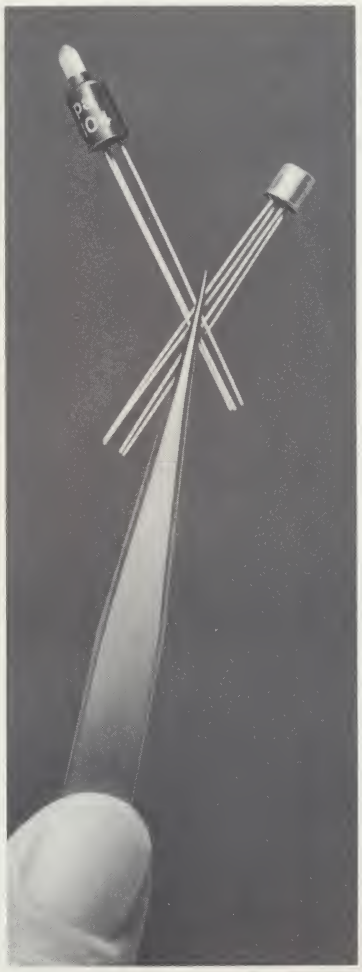
HPA Device	Description	Typical Impedances	Drive	Price 1 - 9	Price 10 - 99
4501	DPDT, Mod/Demod High Z Modulator	Mod. Input 1.25 MΩ, Output 125 KΩ Demod. Output 25 KΩ	250 V, 2.5 mA DC Internal Oscillator 225 Hz	$39.50	$33.50
4502	DPDT, Mod/Demod Low Z Modulator	Mod. Input 150 KΩ, Output 7.5 KΩ Demod. Output 25 KΩ	250 V, 2.5 mA DC Internal Oscillator 95 Hz	39.50	33.50
4503	DPDT, Mod/Demod for Ext. Oscillator, High Z Mod.	60 Hz chopping freq. Mod. Input 5 MΩ, Output 125 KΩ Demod. Output 30 KΩ	170 V peak, 2.5 mA 1 KHz max.	37.50	32.00
4504	DPDT, Mod/Demod for Ext. Oscillator, Low Z Mod.	60 Hz chopping freq. Mod. Input 200 KΩ, Output 5 KΩ Demod. Output 30 KΩ	170 V peak, 2.5 mA 1 KHz max.	37.50	32.00
4505	SPDT, Mod. only High Z	200 Hz chopping freq. Mod. Input 2 MΩ, Output 125 MΩ	170 V peak, 2.5 mA 1 KHz max.	22.50	19.00
4506	SPDT, Mod. only Low Z	200 Hz chopping freq. Mod. Input 75 KΩ, Output 5 KΩ	170 V peak, 2.5 mA 1 KHz max.	22.50	19.50
4507	SPST, PCR High Z	"ON" R 150 KΩ "OFF" R 100 MΩ	150 V peak 1 KHz max.	8.00	6.80
4508	SPST, PCR Low Z	"ON" R 6.8 KΩ "OFF" R 100 MΩ	150 V peak 1 KHz max.	8.00	6.80
4510	SPST, PCR Low Z	"ON" R 1KΩ "OFF" R 100 MΩ	12 V peak	8.00	6.80

device specifications, photocells

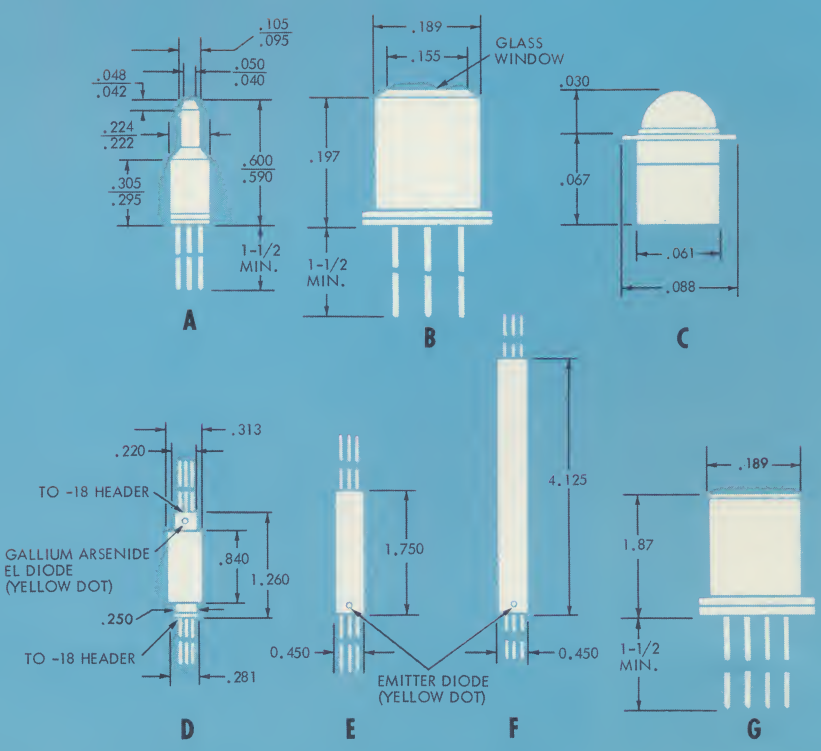
The HPA 4600 series are Cadmium Sulfo-Selenide photocells optimized for speed and stability for use in switching, chopping and control circuits. The cells are hermetically sealed in a TO-5 package and have an optional integral electrostatic shield. Electrical specifications are given at 25°C.

Type	Shield	R_{LIT} KΩ ±50%	R_{DARK} MΩ Typical	Decay Time msecs Typical
4601		100	500	1.2
4603	yes	120	500	1.2
4602		4	500	1.2
4604	yes	5	500	1.2
4606		10	500	1.2
4608	yes	12	500	1.2

optoelectronic devices



optoelectronic package outlines



HPA gallium arsenide infrared sources

The HPA gallium arsenide electro-luminescent diode, when forward biased, radiates at very high intensity a narrow band of infrared light at about 9000 Angstroms.

The HPA 4100 series can be used in conjunction with the 4200 series to form fast photon-coupled pairs for convenient use in card and tape readers, encoders, similar applications.

HPA ultrafast, low noise, silicon PIN photodiode

The HPA silicon planar PIN photodiodes are ultrafast light detectors for visible and near infrared radiation. Their response to blue and violet is unusually good for low dark current silicon photodiodes.

The speed of response of these detectors is less than 1 nanosecond. Laser pulses shorter than 0.1 nanosecond may be observed. The frequency response is DC to 1 GHz.

The low dark current of these planar diodes enables detection of very low light levels. The quantum detection efficiency is constant over six decades of light intensity, providing an excellent dynamic range.

HPA photon coupled isolators

The HPA Photon Coupled Isolator is a wide bandwidth DC coupling device consisting of a gallium arsenide electro-luminescent diode infrared source and a silicon PIN photodetector. Electrical input signals are applied to the GaAs Diode, which emits infrared radiation in proportion to the instantaneous forward current. This radiation is detected by the photodiode, which is well insulated from the emitter. The electrical signals resulting at the photodiode can thereby be controlled from an input in a separate and electrically isolated circuit. The isolation between input and output is typically $10''\Omega$. The device will operate on both AC and DC signals and has a bandwidth greater than 3.5 MHz.

typical characteristics at 25°C

GaAs sources

	4104	4106	4107	Units
Total Power Output P	120	200	100	μW
Modulation Risetime	70	100	100	nsec
Package Outline	A	B	C	

PIN photodiodes

	4201	4203	4204	4205	4207	Units
Response at 7700 Å	1.0	1.0	1.0	1.5	4.0	μA/mW/cm²
Sensitive Area Diameter	2×10^{-3} 0.020	2×10^{-3} 0.020	2×10^{-3} 0.020	3.0×10^{-3}* 0.010	8×10^{-3} 0.040	cm² inches
Speed of Response	<1	<1	<1	<1	<1	nsec
Dark Current (Max.)	2000	2000	100	150	300	pA
Package Outline	A	B	B	C	B	

* Effective area due to lens effect.

photon coupled isolators

	4301	4303	4309	4310	Units
DC Current Transfer I_2/I_1	0.0004	0.0004	0.0004	0.002	
Cutoff Frequency of Current Transfer	3.5	3.5	3.5	3.5	MHz
Coupling Capacitance	0.01	0.01	0.01	2	pF
Isolation Voltage	10,000	20,000	50,000	200	Volts
Package Outline	D	E	F	G	

Hewlett-Packard sales and service offices

HEWLETT PACKARD hp HP ASSOCIATES

ALABAMA
P.O. Box 4207
2003 Byrd Spring Road S.W.
Huntsville 35802
Tel: (205) 881-4591
TWX: 810-726-2204

ARIZONA
3009 North Scottsdale Road
Scottsdale 85251
Tel: (602) 945-7601
TWX: 910-950-1282

232 South Tucson Boulevard
Tucson 85716
Tel: (602) 623-2564
TWX: 910-952-1162

CALIFORNIA
3939 Lankershim Boulevard
North Hollywood 91604
Tel: (213) 877-1282
TWX: 910-499-2170

1101 Embarcadero Road
Palo Alto 94303
Tel: (415) 327-6500
TWX: 910-373-1280

2591 Carlsbad Avenue
Sacramento 95821
Tel: (916) 482-1463
TWX: 910-367-2092

1055 Shafter Street
San Diego 92106
Tel: (714) 223-8103
TWX: 910-335-2000

COLORADO
7965 East Prentice
Englewood 80110
Tel: (303) 771-3455
TWX: 910-935-0705

CONNECTICUT
508 Tolland Street
East Hartford 06108
Tel: (203) 289-9394
TWX 710-425-3416

111 East Avenue
Norwalk 06851
Tel: (203) 853-1251
TWX: 710-468-3750

DELAWARE
3941 Kennett Pike
Wilmington 19807
Tel: (302) 655-6161
TWX: 510-666-2214

MARYLAND
6707 Whitestone Road
Baltimore 21207
Tel: (301) 944-5400
TWX: 710-862-0850

P.O. Box 727
Twinbrook Station 20851
12303 Twinbrook Parkway
Rockville
Tel: (301) 427-7560
TWX: 710-828-9684

MASSACHUSETTS
Middlesex Turnpike
Burlington 01803
Tel: (617) 272-9000
TWX: 710-332-0382

MICHIGAN
24315 Northwestern Highway
Southfield 48076
Tel: (313) 353-9100
TWX: 810-232-1532

MINNESOTA
2459 University Avenue
St. Paul 55114
Tel: (612) 646-7881
TWX: 910-563-3734

MISSOURI
9208 Wyoming Place
Kansas City 64114
Tel: (816) 333-2445
TWX: 910-771-2087

2812 South Brentwood Blvd.
St. Louis 63144
Tel: (314) 644-0220
TWX: 910-760-1670

NEW JERSEY
Crystal Brook Prof. Bldg.
Route 35
Eatontown
Tel: (201) 747-1060

391 Grand Avenue
Englewood 07631
Tel: (201) 567-3933
TWX: 710-991-9707

NEW MEXICO
P.O. Box 8366
Station C 87108
6501 Lomas Boulevard N.E.
Albuquerque
Tel: (505) 255-5586
TWX: 910-989-1665

OHIO
1250 West Dorothy Lane
Dayton 45409
Tel: (513) 298-0351
TWX: 810-459-1925

OREGON
2737 S.W. Corbett Avenue
Portland 97201
Tel: (503) 228-5107

PENNSYLVANIA
Park Place Office Building
Camp Hill
Tel: (717) 737-6791

Monroe Complex
Moss Side Boulevard
Monroeville 15146
Tel: (412) 271-0724
TWX: 710-797-3650

144 Elizabeth Street
West Conshohocken 19428
Tel: (215) 248-1600, 828-6200
TWX: 510-660-8715

TEXAS
P.O. Box 7166
3605 Inwood Road
Dallas 75209
Tel: (214) 357-1881
TWX: 910-861-4081

P.O. Box 22813
4242 Richmond Avenue
Houston 77027
Tel: (713) 667-2407
TWX: 910-881-2645

GOVERNMENT CONTRACT OFFICE
225 Billy Mitchell Road
San Antonio 78226
Tel: (512) 434-4171
TWX: 910-871-1170

UTAH
2890 South Main Street
Salt Lake City 84115
Tel: (801) 486-8166
TWX: 910-925-5681

VIRGINIA
P.O. Box 6514
2111 Spencer Road
Richmond 23230
Tel: (703) 282-5451
TWX: 710-956-0157

WASHINGTON
11656 N.E. Eighth Street
Bellevue 98004
Tel: (206) 454-3971
TWX: 910-443-2303

FLORIDA
P.O. Box 545
Suite 106
9999 N.E. 2nd Avenue
Miami Shores 33153
Tel: (305) 758-3626
TWX: 810-848-7262

P.O. Box 20007
Herndon Station 32814
621 Commonwealth Avenue
Orlando
Tel: (305) 841-3970
TWX: 810-850-0113

P.O. Box 8128
Madeira Beach 33708
410 150th Avenue
St. Petersburg
Tel: (813) 391-0211
TWX: 810-863-0366

GEORGIA
2340 Interstate Parkway
Atlanta 30327
Tel: (404) 436-6181
TWX: 810-751-3283

ILLINOIS
5500 Howard Street
Skokie 60076
Tel: (312) 677-0400
TWX: 910-223-3613

INDIANA
4002 Meadows Drive
Indianapolis 46205
Tel: (317) 546-4891
TWX: 810-341-3263

LOUISIANA
P.O. Box 856
1942 Williams Boulevard
Kenner 70062
Tel: (504) 721-6201
TWX: 810-955-5524

156 Wyatt Drive
Las Cruces 88001
Tel: (505) 526-2486
TWX: 910-983-0550

NEW YORK
1219 Campville Road
Endicott 13764
Tel: (607) 754-0050
TWX: 510-252-0890

236 East 75th Street
New York 10021
Tel: (212) 879-2023
TWX: 710-581-4376

82 Washington Street
Poughkeepsie 12601
Tel: (914) 454-7330
TWX: 510-248-0012

39 Saginaw Drive
Rochester 14623
Tel: (716) 473-9500
TWX: 510-253-5981

1025 Northern Boulevard
Roslyn, Long Island 11576
Tel: (516) 869-8400
TWX: 510-223-0811

5858 East Molloy Road
Syracuse 13211
Tel: (315) 454-2486
TWX: 710-541-0482

NORTH CAROLINA
P.O. Box 5187
1923 North Main Street
High Point 27262
Tel: (919) 882-6873
TWX: 510-926-1516

OHIO
5579 Pearl Road
Cleveland 44129
Tel: (216) 884-9209
TWX: 810-421-8500

CANADA

ALBERTA
Hewlett-Packard (Canada) Ltd.
10010-105th Street
Edmonton
Tel: (403) 424-0718
TWX: 610-831-2431

BRITISH COLUMBIA
Hewlett-Packard (Canada) Ltd.
2184 West Broadway
Vancouver
Tel: (604) 738-7520
TWX: 610-922-5050

NOVA SCOTIA
Hewlett-Packard (Canada) Ltd.
7001 Mumford Road
Suite 356
Halifax
Tel: (902) 455-0511

ONTARIO
Hewlett-Packard (Canada) Ltd.
880 Lady Ellen Place
Ottawa 3
Tel: (613) 722-4223
TWX: 610-562-1952

Hewlett-Packard (Canada) Ltd.
1415 Lawrence Avenue West
Toronto
Tel: (416) 249-9196
TWX: 610-492-2382

QUEBEC
Hewlett-Packard (Canada) Ltd.
275 Hymus Boulevard
Pointe Claire
Tel: (514) 697-4232
TWX: 610-422-3022
Telex: 01-20607

for international sales and service contact:

IN EUROPE

Hewlett-Packard S.A.
54 Route des Acacias
Geneva, Switzerland
Tel: (022) 42 81 50
Telex: 2.24.86
Cable: HEWPACKSA Geneva

ELSEWHERE

Hewlett-Packard
1501 Page Mill Road
Palo Alto, California 94304
Tel: (415) 326-7000
TWX: 910-373-1267
Telex: 34-8461